

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Grimbergen et al.	Group Art Unit: 1792
Serial No: 09/595,778 Confirmation No: 6490	Examiner: Allan W. Olsen
Filing Date: June 16, 2000	Attorney Docket No: 002077 USA D01/ETCH/SILICON/MDD
For: APPARATUS AND METHOD FOR MONITORING PROCESSING OF A SUBSTRATE	July 17, 2008 San Francisco, California

**DECLARATION PURSUANT TO 37 C.F.R. § 1.131**

Box Fee Amendment  
Commissioner for Patents  
Washington, D.C. 20231

Examiner Olsen:

- I. This declaration is to establish conception of the invention of this application in the United States, at a date prior to December 17, 1996, which is the effective date of U.S. Patent No. 5,985,092 to Chiu et al., and further to establish diligent work on the invention from a date prior to December 17, 1996 and up until the invention was reduced to practice.
- II. The persons making this declaration are the inventors of the present application.
- III. Attached to this Declaration is: Exhibit A, titled "Sensor Program Update", part of a presentation by the inventors which describes aspects of the present invention. Dates have been removed from the document. The presentation was drafted prior to December 17, 1996.

IV. From EXHIBIT A it can be seen that the inventors had conceived of a method of processing a substrate in a process chamber comprising a wall, the method comprising: providing a substrate in the process chamber, the substrate having a surface; introducing a gas into the process chamber; energizing the gas by passing RF energy through the wall of the process chamber to the gas inside the process chamber to energize the gas; detecting radiation reflected from the substrate from directly above the surface of the substrate after the radiation propagates through the wall; and evaluating the detected radiation to monitor the depth of a layer being processed on the substrate, as claimed in claim 1.

V. From Exhibit A it can be further seen that the inventors had conceived of a method of processing a substrate in a process chamber comprising a wall and having a non-vertical multi-turn antenna above the wall, the method comprising: placing in the process chamber, a substrate having a layer; introducing a gas into the process chamber; powering the non-vertical multi-turn antenna to couple energy through the wall to the gas inside the process chamber to energize the gas to process the layer on the substrate; detecting radiation reflected from the substrate and propagating through the wall; and evaluating the detected radiation to monitor the depth of the layer being processed on the substrate, as claimed in claim 105.

VI. Exhibit A also demonstrates that the inventors had conceived of a method of processing a substrate in a process chamber comprising a ceiling and an antenna above the ceiling, the method comprising: providing a substrate in the process chamber, the substrate having a surface; introducing a gas into the process chamber; energizing the gas by applying an RF current to the antenna to pass RF energy through the ceiling of the process chamber to the gas inside the process chamber to energize the gas; detecting radiation reflected from the substrate from directly above the surface of the substrate after the radiation propagates through the ceiling; and evaluating the detected radiation to monitor processing of the substrate, as claimed in claim 106.

VII. Exhibit B is a receipt for a UV photo-sensor used to make a prototype apparatus capable of performing the invention of claims 1, 105 and 106. Date information has been redacted from the receipt. However, the receipt date is prior to December 17, 1996.

IIX. Exhibit C is a receipt for a UV lamp used to make a prototype apparatus capable of performing the invention of claims 1, 105 and 106. Date information has been redacted from the receipt. However, the receipt date is prior to December 17, 1996.

IX. Exhibit D is a receipt for a UV lamp used to make another prototype apparatus capable of performing the invention of claims 1, 105 and 106. Date information has been redacted from the receipt. However, the receipt date is prior to December 17, 1996.

X. Exhibit E is a receipt for a set of UV mirrors to fold the optical beam of a prototype apparatus capable of performing the invention of claims 1, 105 and 106. Date information has been redacted from the receipt. However, the receipt date is prior to December 17, 1996.

XI. From Exhibits B, C, D and E it can be seen that diligent work to reduce the invention of claims 1, 105 and 106 to practice began at a date prior to December 17, 1996.

XII. Exhibit F is an excerpt of a presentation titled "DPS Recess Endpoint Status", dated January 22, 1997. Inventors had completed a UV source assembly prototype, and dome with fused window had been successfully mounted on a chamber system.

XIII. From Exhibit F it can be seen that the invention was diligently worked on in the month of January, 1997.

XIV. The activity evidenced by exhibits B, C, D, E and F was performed in the order listed. At no time was the gap between evidenced adjacent steps greater than a span of two months.

XV. Exhibit G is a photograph showing a working chamber capable of performing the processes of claims 1, 105 and 106. The photograph of Exhibit G was taken with a digital camera and has a file creation date of February 20, 1997.

XVI. Exhibit G shows that the invention was reduced to practice at least as early as February 20, 1997.

XVII. As the person signing below, I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

First Inventor: Michael Grimbergen

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Residence: 767 Martinique Drive  
Redwood City, California 94065

Country of Citizenship: United States of America

Second Inventor: Shaoher X. Pan

Signature:  \_\_\_\_\_

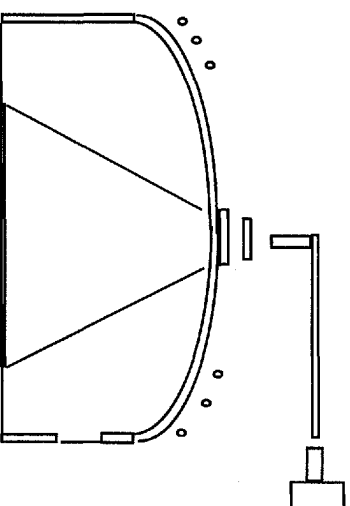
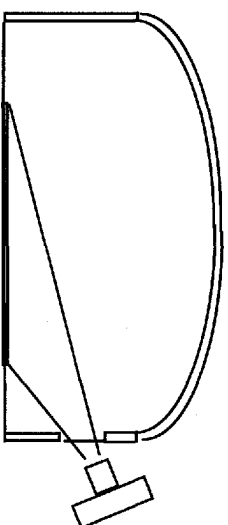
Date: 7/16/2008

Residence: 1133 Kelez Drive  
San Jose, California 95120

Country of Citizenship: United States of America

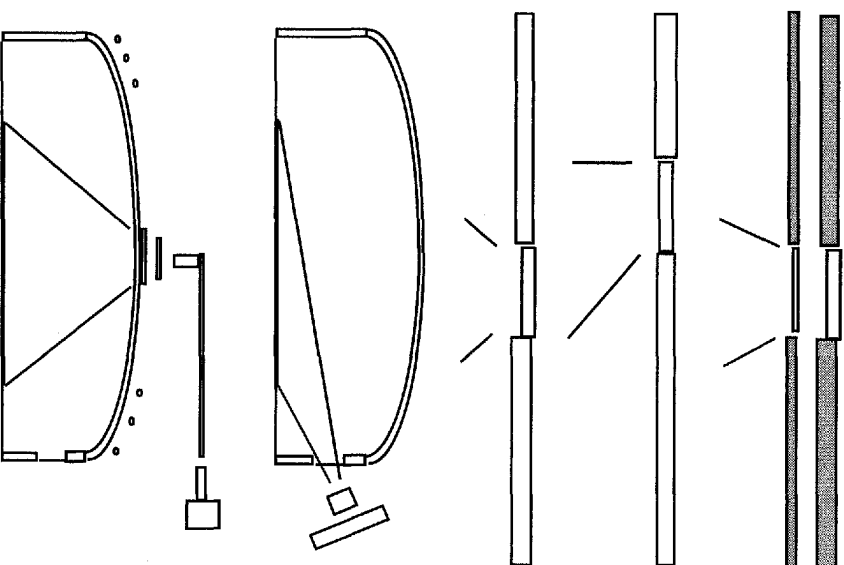
# DPS Implementation Plan

- **Demonstrated interferometry through side window**
  - good image quality
  - topography effect
  - weaker fringe visibility far side of wafer
- **Top-down DTCLU implementation**
  - requires window in ceramic dome
  - limited room for CCD camera
  - image-preserving relay fiber bundle



# LES Chamber Integration Options

- MxP Unilid 21+112 hole GDP two windows
- MxP+ Off-center Sapphire Window single window
- MxP+ Center See-thru SGD centered single window
- DPS side port glancing angle
- DPS top-down



# Recess Etch Endpoint

- **Chamber Hardware:**
  - Lid with window (MxP/Mk II)
  - Dome under development (DPS)
- **Endpoint Hardware:**
  - Monochromatic UV Illumination through top of chamber
  - Optical fiber on top of chamber to std. endpoint system
- **Endpoint Software:**
  - ENDP28 Etch-to-depth
    - Calculates etch rate and endpoint to desired depth

## DPS Recess Etch Plan

- Fabricate quartz dome with UV FS window fused in center
- Fabricate UV source/fiber detector assembly
- Etch 16 Mb Recess 1 wafer
  - use emission for planarization etch
  - evaluate signal intensity in HDP
  - use modified EP S/W with AGC
- Etch 256 Mb Recess 2 wafer 1.5 um deep
  - evaluate fringe visibility at 254nm
- Redesign prototype
- Modify S/W for early AGC for Recess 2,3



DEC 2 1996

**UDT SENSORS, INC.**

12525 Chadron Ave., Hawthorne, CA 90250

(310) 978-0516 • FAX (310) 644-1727

**SHIPPING  
ORDER No 57782**

DATE SHIPPED

**SOLD TO**  
GAGNER-TOOMEY ASSOCIATES  
1680 CIVIC CENTER DRIVE  
SUITE 107  
SANTA CLARA, CA 95050

ATTENTION: MR. MARK GAGNER

SHIP VIA <input type="checkbox"/> UPS <input type="checkbox"/> APP		OTHER		NO OF PACKS		PARTIAL		COMPLY		INSURANCE		PPD COLLECT		AC NO	
UPS				1				X		Yes X No		X		611-70650	
CUST P O		DEBIT MEMO NO		MWO NO		UDT PO		CT LOG NO		CUSTOMER RET					
ITEM	QTY SHIPPED	UNIT	STOCK NO	DESCRIPTION		UNIT PRICE		TOTAL							
1	1		11-09-006	UDT UV005 (FOP CUSTOMER) APPLIED MATERIALS											
				NO CHARGE											

PETER C. WILLIAMSON/SALES MANAGER WESTERN REGION

TOTAL FOR CUSTOMS PURPOSES ONLY

White(Packing List) , Blue(Accts) , Green(Shipping) , Canary(Manufacturing) , Pink(Originator) , Gold(Utility) .

**INVOICE****Jelight Company, Inc.**

2 Mason, Irvine, CA 92718  
 PHONE: (714) 380-8774 • FAX: (714) 768-9457

INVOICE NO.

18857

INVOICE DATE

12:13

PAGE

**BILL TO:**

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**SHIP TO:**

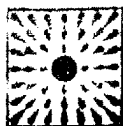
MIKE GRIMBERGEN  
 APPLIED MATERIALS  
 767 MARTINIQUE DRIVE  
 REDWOOD CITY, CA 94065-1339

MISC

CUSTOMER		SHIP VIA	F.O.B.		TERMS	
MISC		IRVINE, CA	Net 30 Days			
PURCHASE ORDER NUMBER		SALESPERSON		ORDER DATE	OUR ORDER NUMBER	
Verbal/MIKE		SG			5651	
QTY. ORDERED	QTY. SHIPPED	ITEM NUMBER	UNIT OF MEASURE	UNIT PRICE	EXTENDED PRICE	
	BACKORDERED	ITEM DESCRIPTION		DISCOUNT %	TAX	
1	1	82-3309-1	EA	116.25		116.25
	0	LAMP, R.F.D.B.		0.000	Y	
THIS IS A REPLACEMENT FOR INVOICE 18026. THE WRONG LAMP WILL BE RETURNED UNDER RMA#1664.						
SHIP UNDER JELIGHT UPS ACCOUNT.						
NONTAXABLE SUBTOTAL:						0.00
TAXABLE SUBTOTAL:						116.25
TOTAL TAX (8.2500%)						9.59
TOTAL:						125.84

**THANK YOU**

## INVOICE

**Jelight Company, Inc.**

2 Mason, Irvine, CA 92718

PHONE: (714) 380-8774 • FAX: (714) 768-9457

INVOICE NO.

18078

INVOICE DATE

14:25

PAGE 1

BILL TO:

SHIP TO:

MIKE GRIMBERGEN  
APPLIED MATERIALS  
767 MARTINIQUE DRIVE  
REDWOOD CITY, CA 94065-1339

MISC

CUSTOMER		SHIP VIA	F.O.B.		TERMS	
MISC		UPSEED	IRVINE, CA		Net 30 Days	
PURCHASE ORDER NUMBER			SALESPERSON		ORDER DATE	OUR ORDER NUMBER
Verbal			SG			5657
QTY. ORDERED	QTY. SHIPPED BACKORDERED	ITEM NUMBER	UNIT OF MEASURE	UNIT PRICE	DISCOUNT %	TAX
ITEM DESCRIPTION				EXTENDED PRICE		
1	1 0	82-3309-1 LAMP, O.F.O.B.	EA	116.25 0.000		Y
THIS IS A REPLACEMENT FOR INVOICE 18067. THE WRONG LAMP WILL BE RETURNED UNDER RMA#1666. SHIP UNDER JELIGHT UPS ACCOUNT.						
NONTAXABLE SUBTOTAL:				0.00		
TAXABLE SUBTOTAL:				116.25		
TOTAL TAX (8.2500%)				9.54		
TOTAL:				125.79		

THANK YOU

\*PICKING SHEET\*

PAGE: 1

REYNARD CORPORATION  
1020 CALLE SOMBRA  
SAN CLEMENTE, CA. 92673-6227  
FAX (714) 498-9528  
(714) 366-8866

ORDER NUMBER: 0006423  
SALESPERSON FRANK SCOTT  
DUE DATE  
SHIP TO:  
MIKE N GRIMBERGEN/CA  
767 MARTINIQUE DRIVE

SOLD TO:  
MIKE N GRIMBERGEN/CA  
BILL TO: VISA CARD #  
3903 EXP 6/99  
REDWOOD CITY CA 94065  
CONFIRM TO: MICHAEL N GRIMBERGEN

REDWOOD CITY CA 94065

CUSTOMER P.O.	SHIP VIA	F.O.B	TERMS
CREDIT CARD	UPS	SAN CLEMENTE, CA	COD

ITEM NO.	UNIT	ORDERED	SHIPPED	BACK ORD
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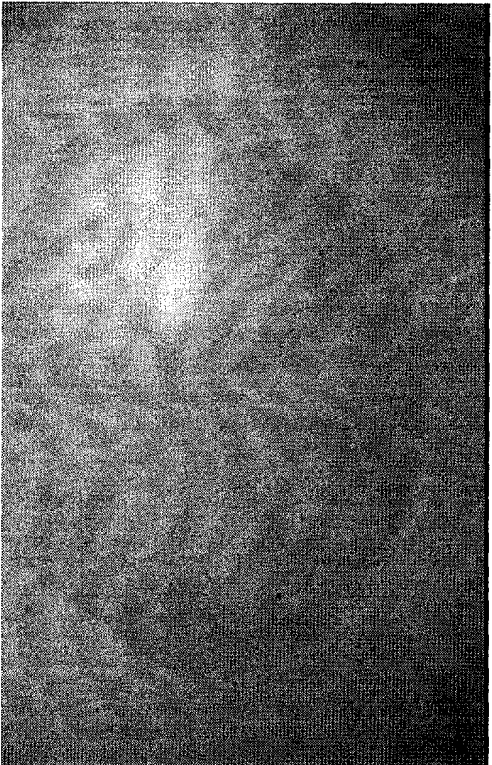
NOTE: COAT WITH -73 ULTRAVIOLET ALUMINUM

# Recess Etch Endpoint for DPS

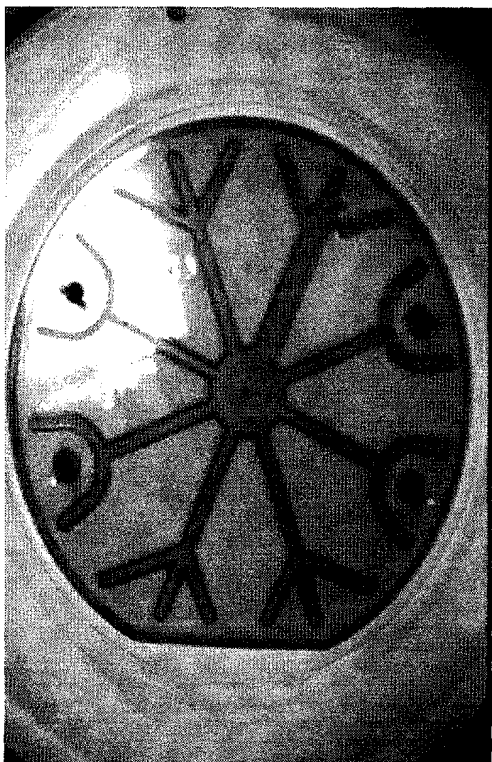
- **Status**
  - UV (254nm) source assembly prototypes completed
  - UV Quartz window fused into quartz dome mounted on EP1
- **Approach**
  - Mount UV source assembly above quatrz dome inside unheated dome unit
- **Issues**
  - Limited chamber availability
- **Plan**
  - Demonstrate endpoint hardware feasibility with quartz dome on EP1 chamber
  - Assess demonstrated process on A3 chamber with quartz dome

# LES View from Top of Dome

Flame-polished  
quartz dome



UV window fused  
in quartz dome



6" e-chuck, EP1 - no DTCTU  
8mm lens, 610nm wavelength

